

# Quantification of Bed-Load Transport Using Multi-beam Survey Data The ISSDOT Method (Integrated-Section Surface Difference Over Time)

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The ISSDOT method (formerly named Integrated Surface Difference Over Time, ISDOT) uses multi-beam bathymetric data to determine bed-load transport in large sand bed rivers. Work conducted so far has been part of the Monitoring of Completed Navigation Projects (MCNP) program, and was begun in the summer of 2001. The bathymetric data are collected in swaths transverse to the direction of flow and across the entire river cross section.

The ISSDOT method is applied by taking at least two sets of bathymetric data (swaths), at different times, for the same spatial location. The two data sets are interpolated to a spatial grid and a difference plot is produced. Incremental volumes are calculated and summed over the entire cross section. Some of the data used for such computations came from Pool 8 on the Upper Mississippi River.

The size of the computational grid, as well as the timing of the swaths are both very important. In the cases of the applications performed to date on actual rivers, a computational grid consisting of one-foot squares has been used. The grids with their associated bathymetric elevations represent the exact same surface at two different points in time. Any one grid can be subtracted from another to produce a difference plot. The difference for any square foot between surface 1 or surface 2 for example, represents the change in volume over time for that incremental area. Presently, both deposition into and scour out from any element are considered as positive transport. Adding up all the incremental changes in volume across the section produces the net change in volume over time for that section. This volume can then be multiplied by the density of the sediment-water mixture to yield a bed-load transport rate.

The method was first applied on Pool 8 of the Upper Mississippi River in November of 2001. A special cooperative effort was conducted with researchers from the University of Utrecht, the Netherlands, in November of 2002. The Dutch researchers used the Delft-Nile sampler and their own dune tracking technique to estimate the bed-load transport on the Mississippi River near Vicksburg Mississippi. ISSDOT was used at the same time. Additionally, a special flume study was carried out with researchers at the National Sedimentation Laboratory in Oxford Mississippi in the fall and winter of 2002-2003. The preliminary results are encouraging. In all of the three cases mentioned above, the transport rates computed using ISSDOT are not only reasonable, but well within the range of other measurement techniques. Due to the necessity for brevity in an abstract such as this, no further details will be given. However, more details are given in a Technical Note located at: <http://chl.wes.army.mil/library/publications/chetn/pdf/chetn-vii4.pdf>.

Further research is ongoing. As more results become clear, they will be made available in appropriate venues.